SoxB1 Activity Regulates Sensory Neuron Regeneration, Maintenance, and Function in Planarians.

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Public Summary:
SoxB1 proteins are key transcriptional regulators of stem cells and organismal development. Ross et al. show that a SoxB1 gene is required for regeneration and maintenance of sensory neuron populations in the planarian Schmidtea mediterranea. Inhibiting the activity of SoxB1 or SoxB1-regulated genes impairs sensory function and triggers seizure-like movements.

Scientific Abstract:
SoxB1 genes play fundamental roles in neurodevelopmental processes and maintaining stem cell multipotency, but little is known about their function in regeneration. We addressed this question by analyzing the activity of the SoxB1 homolog soxB1-2 in the planarian Schmidtea mediterranea. Expression and functional analysis revealed that soxB1-2 marks ectodermal-lineage progenitors, and its activity is required for differentiation of subsets of ciliated epidermal and neuronal cells. Moreover, we show that inhibiting soxB1-2 or its candidate target genes leads to abnormal sensory neuron regeneration that causes planarians to display seizure-like movements or phenotypes associated with the loss of sensory modalities. Our analyses highlight soxB1-2-regulated genes that are expressed in sensory neurons and are homologous to factors implicated in epileptic disorders in humans and animal models of epilepsy, indicating that planarians can serve as a complementary model to investigate genetic causes of epilepsy.